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UTILIZATION OF THE INTERNATIONAL SPACE STATION FOR CREW AUTONOMOUS SCHEDULING TEST (CAST)

Abstract

The United States space policy is evolving toward missions beyond low Earth orbit. In an effort to meet that policy, NASA has recognized Autonomous Mission Operations (AMO) as a valuable capability. Identified within AMO capabilities is the potential for autonomous planning and replanning during human spaceflight operations. That is allowing crew members to collectively or individually participate in the development of their own schedules. Currently, dedicated mission operations planners collaborate with international partners to create daily plans for astronauts aboard the International Space Station (ISS), taking into account mission requirements, ground rules, and various vehicle and payload constraints. In future deep space operations the crew will require more independence from ground support due to communication transmission delays. Furthermore, crew members who are provided with the capability to schedule their own activities are able to leverage direct experience operating in the space environment, and possibly maximize their efficiency. CAST (Crew Autonomous Scheduling Test) is an ISS investigation designed to analyze three important hypotheses about crew autonomous scheduling. First, given appropriate inputs, the crew is able to create and execute a plan in a reasonable period of time without impacts to mission success. Second, the proximity of the planner, in this case the crew, to the planned operations increases their operational efficiency. Third, crew members are more satisfied when given a role in plan development. This paper presents the results from a single astronaut test subject who participated in five CAST sessions. The details on the operational philosophy of CAST are discussed, including the approach to crew training, selection criteria for test days, and data collection methods. CAST is a technology demonstration payload sponsored by the ISS Research Science and Technology Office, and performed by experts in Mission Operations Planning from the Flight Operations Directorate at NASA Johnson Space Center, and

researchers across multiple NASA centers. It is hoped the results of this investigation will guide NASA's implementation of autonomous mission operations for long duration human space missions to Mars and beyond.